ALLERGY SYMPTOM PREDICTION& DETECTION USINGANDROID WEB PLATFORM

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***Abstract*—The system is based on Android-based platform to warn the medical staff of the onset of allergy reactions during a provocation test in a hospital. The portable system carries out the analysis of the heart rate variability for the early detection of allergic reactions in patients undergoing allergy provocation tests at hospitals. The system is composed of an ECG (electrocardiogram) acquisition system and an Android device (Smartphone, Tablet) that monitors and evaluates the results in run time, to increase the safety of allergic tests. Formerly, food and drug allergic tests are major problem for patients because of their long duration and intrusion. However, an algorithm is designed for detecting allergy reactions that have focused on reducing the time of the tests and the number of doses. This algorithm runs on an Android platform and it is able to provide notifications for the medical staff if there is an allergic reaction. The proposed monitoring system is very suitable for the health monitoring during the provocation tests.**

Keywords— Smartphone, android platform, ECG (electrocardiogram), Heart rate variability (HRV)

1. INTRODUCTION

The quick development and great acceptance of the base concept of the Internet of Things have allowed an increase of applications dedicated to obtaining clinical parameters related to the patient. Many of these applications have taken an advantage of the availability of portable devices such as Smartphones. Heart Rate (HR) monitors are the most commonly used devices for health monitoring in Smartphones. Due to the relationship between the heart rate with other physiological systems behavior (central nervous system, respiratory, vasomotor, thermoregulatory, etc.), it is possible to analyze those systems by observing the HR's variability. Usually, these changes are analyzed beat-by-beat, i.e. by computing the HR, which is equivalent to the time interval between each pair of adjacent heartbeats.

The obtained signal is the so-called Heart Rate Variability (HRV) signal. It depicts an example of HRV signal of a healthy subject performing different activities, as it can be distinguished by observing the mean value of the HRV (~80 beats per minute –bpm- while sitting and ~110 while walking).

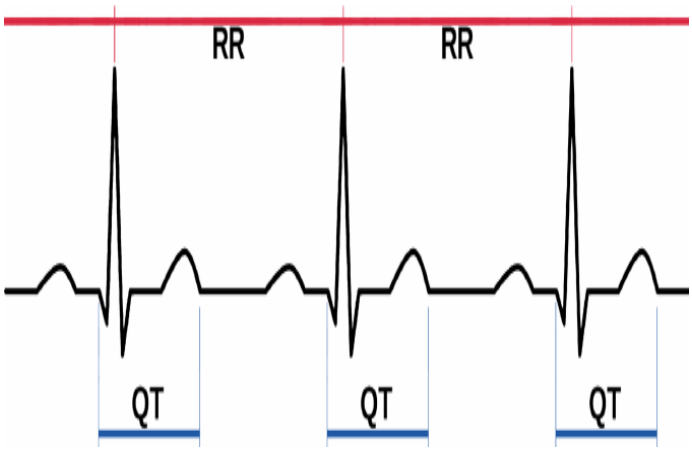


Fig.1. Representation of RR intervals of the ECG signal.

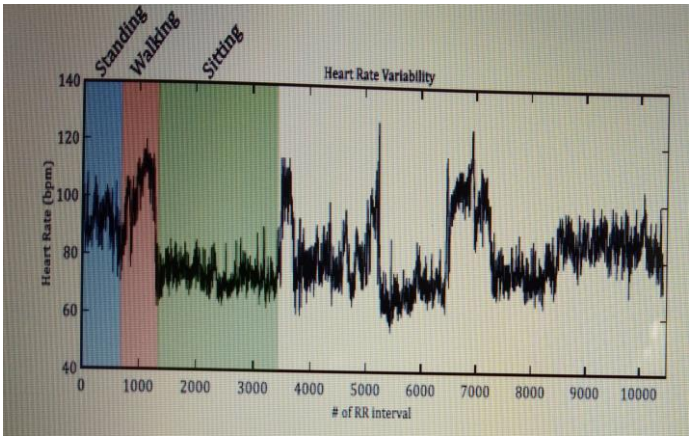


Fig.2. Heart Rate Variability for each RR interval of a healthy subject performing different physical activities: walking, standing, sitting, etc.

There are a lot of features of the HRV signal that have been analyzed over the last years. Based on these studies it has been obtained models of the HRV signal to generate information related to different physiological systems. Consequently, there are a lot of systems to use the HRV signal as a tool for the diagnosis of diseases, with these systems; we have designed a system for the early detection of allergic reactions based on the analysis of the HRV,

shows the complete system composed of an acquisition system and an Android-based host. As the current sport HR monitors are not appropriate for a precise measurement of the HRV, a portable device acquires the ECG signal. This device has an Inertial Measurement Unit (IMU), which is able to provide information about the movement of the person that carries it. The communication between the acquisition system and the host is possible through a Bluetooth link.

There may various factors which may trigger an Allergy attack, which varies from person to person. Some of the common factors which trigger these are:

- Infections
- Food and food additives
- It can happen after an exercise.
- Smoking and chemical fumes
- Sinusitis
- Outdoor allergens, such as pollens from grass, trees and weeds
- Indoor allergens, such as pet dander, dust mites and mold

In our System propose we have used dataset using those dataset we detect ECG and HRV signal. In our system we used totally a software technique that is why our system requires less time to process.Here we try to measure and predict when a person is about to have an allergy attack. A new generation of mobile sensing approaches hasvery significant advantages over traditional platforms in terms of testing speed, control, low cost, ease-of-operation, and data management, user involvement and requires none of the equipment.Whenever user is about to have an allergy attack, a warning is sent to their smart phone as a notification.

Thus,the person moves away to some safe zone free from factors which can trigger the attack. We propose a system and method which will help a person to avoid some situations which cause such health trouble. The main emphasis is to bypass the use of expensive and bulky instrumentation-based routine tests, performed by trained personnel, with the goal of cost saving and time efficiency.

Smartphones are equipped with numerous components that can be employed for measurement and detection, such as a fast multicore processor, digital camera, battery, visual display, and intuitive user interface. Smartphones also possess several wireless data transfer modalities (e.g., cellular data service, Wi-Fi, Bluetooth), allowing test results to be displayed immediately to the user and/or transmitted to cloud databases.

II.LITERATURE SURVEY

Paper Name: Android based warning system for the early detection of allergic reactions

Authors: E. Diaz, R. Gutierrez, J. J. Garcia, W. Marnane*, A.Jimenez, D. Gualda Year: 2017.

Description: This work proposes an Android-based platform to warn the medical staff of the onset of allergy reactions during a provocation test in a hospital. The portable system carries out the analysis of the heart rate variability for the early detection ofallergic reactions in patients undergoing allergy provocation tests at hospitals. The proposal is composed of an ECG (electrocardiogram) acquisition system and an Android device (Smartphone, Tablet) that monitors and evaluates the results in real time, increasing the safety of allergic tests. At present, food and drug allergic tests are a major problem for patients because of their long duration and intrusion. However, the authors have designed an algorithm for detecting allergy reactions that have focused on reducing the time of the tests and the number of doses. This algorithm runs on an Android platform, and it is able to provide alarms for the medical staff if there is an allergy reaction. The proposed monitoring system is very suitable for the health monitoring during the provocation tests.

Paper Name: Twitter Opinion Mining for Adverse Drug Reactions.

Authors: Liang Wu, Teng-Sheng Moh, Natalia Khuri Year: 2015.

Description: Although rigorous clinical studies are required before a drug is placed on the market, it is impossible to predict all side effects for the approved medication. The United States Food and Drug Administration actively monitors approved drugs to identify adverse events. The FDA Adverse Event Reporting System (FAERS) contains a database of adverse drug events reported by the healthcare providers and consumers. The ubiquitous online social networks, such as Twitter, can provide complementary information about adverse drug events. Short Twitter postings, or tweets, are often used to express an opinion about drugs, as well as solicit and receive feedback from consumers of a drug. Thus, adverse drug events can be discovered by extracting from tweets users' opinions about drugs. Here, we developed a computational pipeline for collecting, processing, and analyzing tweets to find signals about adverse drug reactions, defined as drug side effects caused by a drug at a normal dose during normal use. Manual examination of processed tweets identified several known side effects of for drugs.

Paper Name: Public Health Allergy Surveillance Using Microblogs

Authors: KrutiNargund, Natarajan S. Year: 2016.

Description: In recent days, lot of data getting generated in internet especially in micro blogs like twitter. 500 million tweets are getting generated every year and it keeps increasing exponentially. It is observed that people tweet about wide range of subjects which includes politics, weather, sports, health etc. Our study focuses on analyzing health related tweets and the main focus is on allergy disease. We are trying to classify the tweets into two classes, one contains the tweets which are actual incidents of allergy and another class contains awareness tweets. Classification is done using different classifiers such as Naïve Bayes, Naive Bayes Multinomial Modal, Support Vector Machine, k-Nearest Neighbor (k-NN) and it is found that k-NN classifiers' precision is better than other classifiers. The study also includes fetching the types of allergy from collected tweets. And the trained classifier model is used to classify the live streaming tweets of different locations. Location wise spread of allergy is analyzed by using the geo-code of different geographic location.

Paper Name: From lightweight ontology to mental illness indication

Authors: PetrSaloun Year: 2015.

Description: Mosaic of research, applications and case studies, starting with natural language text processing, automated domain building, sentiment analysis, document similarities, and ending with indication of mental illness based on self-essay analysis, is given in an overview of this extended abstract of the invited paper.

III. ALLERGY DETECTION

In the system, it maintains HRV and ECG based allergy dataset. At first it submits readings of cardio with attributes. The system then searches for the medicine name and symptoms then the system performs clustering. The detected reading is matched with the dataset, for specific allergic profiles and show details to the user of detected allergy type. Without performing long procedural, uncertain and costlier medical test, system can predict specific type of allergy to patient using detailed signal. The system helps in cutting time, uncertainty and increasing speed of treatment with minimal error generation.

This system can be deployed onto the field with less economic risks; the system does not need any other special utilities or hardware. Semi-skilled / Non-Skilled manpower is
required. This system can be easily modified and updated to the upcoming changes in day-to-day life.

In existing system, the technology used is completely hardware based in order to detect ECG and HRV signal it consumes a large amount of time to generate the result. Previously, the patient had to visit the hospital for a check-upthen thedoctor will check patient and write different types of test. That means the actual problem will be recognized after a series of tests as the allergy is detected by using sensors and the system is hardware oriented*Fig3.*The current sport HR monitors are not appropriate for a precise measurement of the HRV, a portable device acquires the ECG signal. A previous investigation demonstrated that there is a relationship between changes in several patients' HRV signal and a posterior occurrence of allergic reactions.

Disadvantages of existing system:

- The patientneeds to give the different test.
- Actual allergy may not analyze.
- Take more time to check.

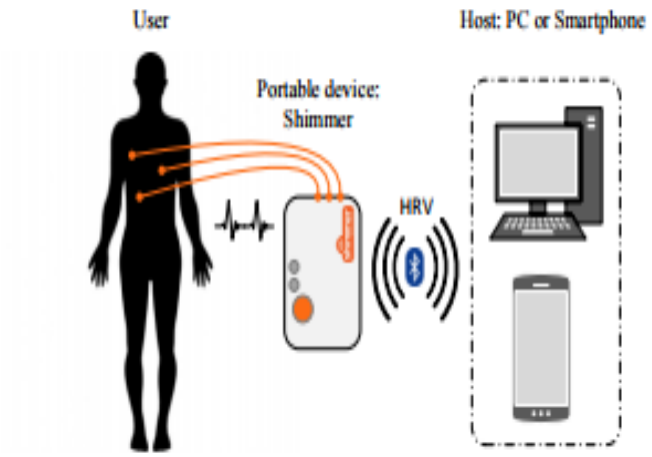


Fig.3. Existing System

The system proposes that the used dataset will accureately take the reading of detected ECG and HRV signals from the body of patient to detect the problem. The proposed system used is mostly software oriented and uses a minimal amount of hardware which makes the system more accurate and requires less amount of time to generate the result based upon the database created by software.*Fig.4.*

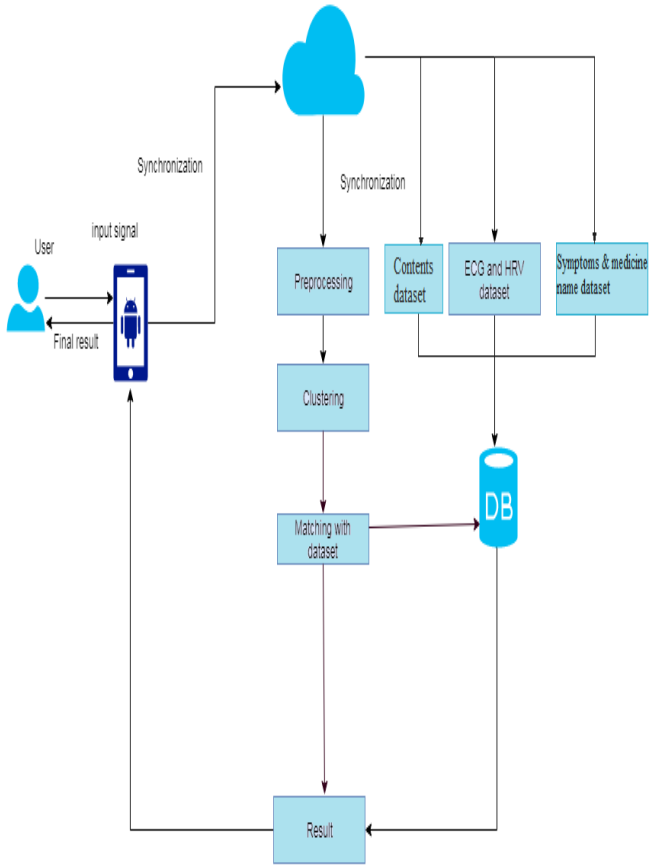


Fig.4. Proposed System

IV. DIFFERENT TYPES OF ALLERGIES

Allergies are hypersensitive responses from the immune system to substances that either enter or come into contact. If a person is allergic to a substance, such as pollen, their immune system reacts to the substance as if it was foreign and harmful, and tries to destroy in the body.

A.Viral Infections:

Viral Infection is a primary cause of common allergy affecting people. In simple terms a disease that could be caused by a variety of types of virus is known as Viral Infection. It can affect different parts of the human body. It has been observed that some viruses are in the intestine, while many are in lungs and airways.

B. Bacterial Infections:

Bacterial infection is an intrusion of a harmful strain of bacteria on or inside the body. Bacteria could infect any area of the body. Pneumonia, meningitis, and food poisoning are just a variety of few infections that may be caused byharmful bacteria. While there are some of the bacteria'sthat prove to be a healthy source of diet probiotics that help keep human body healthy.

C. Mosquito Biting:

Mosquitoes are carriers for airborne diseases, out of which some of them are lethal. Virus/viral is the most common and dangerous mosquito-transmitted disease. Mosquitoes also lead to a variety of diseases like malaria, dengue fever and Chikungunya. These symptoms are visible within a time span of two days to two weeks after a mosquito bite.Some of the symptoms of mosquito bites include soft bumps on the skin that become pink, red, and itchy.

D. Rashes:

Rashes are a noticeable change in the texture or colour of the skin. The skin eventually becomes scaly, bumpy, itchy, or else irritated. There are a variety of causes for rashes, including the following which have been listed below:

- Allergies
- medications
- cosmetics
- certain diseases, such as chickenpox and measles

V. DIFFERENT ALGORITHMS

A. K MEANS:

K-means simple and easy way to classify a given data set through a certain number of clusters (assume k clusters). The main idea is to define k centers, one for each cluster. These centers should be placed in a cunning way because of different location causes different result. So, the better choice is to place them as much as possible far away from each other. The next step is to take each point belonging to a given data set and associate it to the nearest center. When no point is pending, the first step is completed and an early group age is done. At this point we need to re-calculate k new centroids as barycenter of the clusters resulting from the previous step. After we have these k new centroids, a new binding has to be done between the same data set points and the nearest new center. A loop has been generated. As a result of this loop we may notice that the k centers change their location step by step until no more changes are done or in other words centers do not move any more.

$$J = \sum_{i=1}^{k} \sum_{j=1}^{n} \left\| x_j - c_i \right\|^2$$

ADVANTAGES:

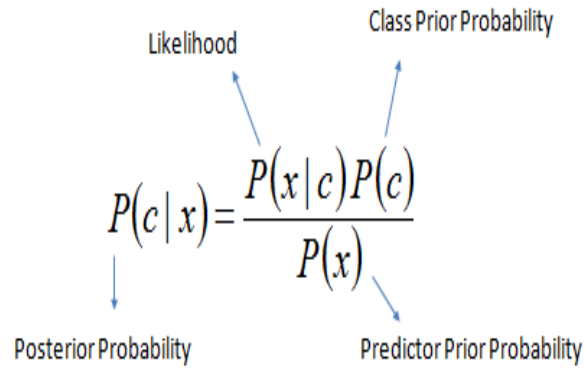
- **Fast** – Achieves the final result of its iterations in a fast way due to the simplicity of the algorithm.
- **Simple and reliable** – The process is fairly simple and always terminates, solving the problem with a solution set even for large data sets of information.
- **Efficient** – This method presents a good solution with relative low computational complexity for the clustering problem.
- **Good Solutions** – Provides the best result set specifically when data points are fairly separated.

B. NAÏVE BAYES:

In machine learning, ***Naive Bayes classifiers*** are a family of simple probabilistic classifiers based on applying Bayes' theorem with strong (naive) independence assumptions between the features. Naive Bayes classifiers are highly scalable, requiring a number of parameters linear in the number of variables (features/predictors) in a learning problem. Maximum-likelihood training can be done by evaluating a closed-form expression, which takes linear time, rather than by expensive iterative approximation as used for many other types of classifiers. Naive Bayes is a simple technique for constructing classifiers: models that assign class labels to problem instances, represented as vectors of feature values, where the class labels are drawn from some finite set.

For example, a fruit may be considered to be an apple if it is red, round, and about 10 cm in diameter. A naive Bayes classifier considers each of these features to contribute independently to the probability that this fruit is an apple, regardless of any possible correlations between the color, roundness, and diameter features. For some types of probability models, naive Bayes classifiers can be trained very efficiently in a supervised learning setting. In many practical applications, parameter estimation for naive Bayes models uses the method of maximum likelihood; in other words, one can work with the naive Bayes model without accepting Bayesian probability or using any Bayesian methods.

An advantage of naive Bayes is that it only requires a small number of training data to estimate the parameters necessary for classification.



$$P(c \mid X) = P(x_1 \mid c) \times P(x_2 \mid c) \times \cdots \times P(x_n \mid c) \times P(c)$$

P(c|x) is the posterior probability of class (target) given predictor (attribute).

P(c) is the prior probability of class.

P(x|c) is the likelihood which is the probability of predictor given class.

P(x) is the prior probability of predictor.

VI. FUTURE SCOPE

As a future work, it is proposed the use of the IMU data provided by the acquisition module (Shimmer) for two reasons. Firstly, it helps to locate the patients within the hospital providing then more information to the medical staff; and secondly, the acceleration data can be used to reduce false positives (the HRV can be modified by the patients' movement as well). Finally, it is necessary to extend the clinical trial in order to get enough patients to conclude how good the performance of the proposed system.

VII. RESULT

Table I shows the result. We have evaluated the performance and usefulness of the classification algorithms for predicting allergy symptom of patients. Also, we compare the performance of the proposed system with existing algorithm.

Table I

Classifier	Accuracy (%)
K-means (Proposed)	59.02
Naïve Bayes (Proposed)	61.24

The comparative analysis of these algorithm to classify allergy symptomsNaïve Bayes shows the improved performance.

VIII. CONCLUSION

We conclude that, providing a patient good service through android web platform by using allergy symptom prediction detection using android web platform. This paper focuses on developing an automated allergy detecting system. It saves time and effort, in this paper; we have proposed a new method for measuring the signal using datasets of HRV and ECG.

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